

NON-PUBLIC?: N
ACCESSION #: 9005010072
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Duane Arnold Energy Center PAGE: 1 OF 04

DOCKET NUMBER: 05000331

TITLE: Momentary Spike on Local Power Range Monitor Results in Automatic Scram During Reactor Startup
EVENT DATE: 04/01/90 LER #: 90-004-00 REPORT DATE: 04/25/90

OTHER FACILITIES INVOLVED: None DOCKET NO: 05000

OPERATING MODE: N POWER LEVEL: 008

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Hai Tran, Technical Support Engineer TELEPHONE: (319) 851-7491

COMPONENT FAILURE DESCRIPTION:
CAUSE: B SYSTEM: IG COMPONENT: DET MANUFACTURER: G082
REPORTABLE NPRDS: YES

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On April 1, 1990 at 0532 hours, during reactor startup, a momentary increase in indicated flux on Average Power Range Monitor (APRM) channels "C" and "D" to greater than 15 percent of rated power resulted in an automatic reactor scram. The plant was at approximately eight percent thermal power. The APRM scram was originated from Local Power Range Monitor (LPRM) 32-09c, which feeds its output signal to APRM channels "C" and "D". These APRM channels feed opposite sides of the Reactor Protection System (RPS) logic. The most probable cause was metallic particles formed in the LPRM detector, which shorted the anode to the cathode. This resulted in a momentary spike which was sensed as a power increase by the APRMs, and subsequently the RPS logic. When the switch is in startup mode, the upscale trip setpoint is set at 15 percent of rated power. The plant responded to the scram as designed with no observed equipment failures.

Following the scram, a review of the event and troubleshooting of the failed LPRM were performed. The LPRM was bypassed and reactor startup commenced without further complications.

This event is being reported pursuant to 10 CFR 50.73(a)(2)(iv).

END OF ABSTRACT

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I. DESCRIPTION OF EVENT:

On April 1, 1990 at 0532 hours during reactor startup, with the reactor at approximately eight percent power, with bypass valve #1 35 percent open and the turbine/generator off line, a spike in indicated flux on "C" and "D" Average Power Range Monitor (APRM, EIIS System Code IG) channels to greater than 15 percent of rated power resulted in an automatic reactor scram. The trip setpoint for APRMs in startup mode is 15 percent of rated reactor power. Upon investigation, it was found the Local Power Range Monitor (LPRM, EIIS System Code IG) 32-09c (Component Function Identifier DET) had an upscale alarm light sealed in. LPRM 32-09c feeds APRM channels "C" and "D".

The APRM subsystem has six APRM channels, each of which averages input signals from a number of LPRM channels (80 total). APRM channels A, C, and E are associated with the "A" Reactor Protection System (RPS) trip system and APRM channels B, D, and F are associated with the "B" RPS trip system. APRM channels E and F average outputs signals from 20 LPRMs each, APRM channels A and B average outputs from 20 shared LPRMs, and APRM C and D average outputs from 20 shared LPRMs. A non-shared LPRM which spikes has a potential for causing a half scram, whereas a shared LPRM which spikes has a potential for causing a full scram. LPRM 32-09c is one of the shared LPRM's that feeds its output signal to APRM channels "C" and "D". An APRM upscale initiates the associated RPS neutron monitoring system trip. When the reactor is in other than the run mode, the upscale trip setpoint is set at a fixed 15 percent of rated power, whereas the upscale trip setpoint varies with core flow in the run mode.

Following a review of the event and troubleshooting of the failed LPRM to help determine the root cause, the LPRM was bypassed. Reactor startup commenced at 1537 hours. Reactor startup was completed without further complications.

II. CAUSE OF EVENT:

The intermediate cause of this event was a momentary LPRM spike which

resulted in an upscale trip of both "C" and "D" APRM channels, which in turn caused the RPS to scram the reactor. The most probable cause for the LPRM spike was metallic particles or "whiskers" formed in the detector, which shorted the anode to the cathode (see Corrective Actions for further discussion of whisker effect). A "Current/Voltage" test was performed on the same day to help determine the root cause. The check indicated there were whiskers in the detector.

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Per General Electric (GE) Service Information Letter (SIL) 500 and GE document GEK-83439, metallic particles shorting the anode to the cathode can cause spiking.

III. ANALYSIS OF EVENT:

Following the scram, Integrated Plant Operating Instructions (IPOI) 5, "Reactor Scram" was completed without complications. The scram was reset at 0536 hours, and IPOI-4, "Reactor Shutdown" actions were completed without complications. Following the scram, reactor water level decreased to approximately 180 inches above Top of Active Fuel (TAF) and was maintained with feedwater. The reactor scram and plant response was as designed and with no observed equipment failures. All controls rods were fully inserted, and no thermal limit violation occurred. No safety systems, other than RPS, were actuated, nor were they required for this event.

Had the LPRM spike occurred under different plant conditions, such as the run mode, the significance of this event would have been no greater. In fact, in the run mode, there is a significant probability that the spiking of a single LPRM would not result in an APRM indication increase greater than the operating scram setpoint. There were no violations of any Technical Specifications and no effect on the safe operation of the plant.

IV. CORRECTIVE ACTIONS:

SIL 500, "LPRM Spiking" addresses the generic issue of LPRM spiking and attributes spiking to problems with the stability of the uranium coating on the detector cathode. A "Current/Voltage" routine test was implemented prior to the event. Supplemental actions identified in the SIL for troublesome LPRMs are in the process of implementation.

The following corrective actions were completed prior to startup:

1. LPRM 32-09c was bypassed and a warning tag hung to indicate its status.

2. Initial diagnostic testing of LPRM 32-09c was completed to help determine the root cause.

In addition to the immediate corrective actions, the following long term corrective actions have also been initiated.

1. An investigation of LPRM strings with histories of weak performance will be completed by June 30, 1990.

2. A questionnaire concerning the LPRM spikes has been sent out via the INPO Nuclear Network information exchange in search of other plants who may have experienced a similar event.

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IV. ADDITIONAL INFORMATION

1. Failed Component Information.

This LPRM detector was made by the General Electric Company in 1986. It is model RS-200, and was put into service in April, 1987 during the cycle 8/9 refuel outage.

2. Previous Similar Events.

One similar event occurred in February, 1985 (LER 85-004) following a controlled shutdown for a scheduled refuel outage. An APRM upscale trip (>15% reactor power) occurred with the reactor shutdown. The APRM scram originated from a shorted LPRM that has common inputs to the "A" and "B" APRM channels.

This event is being reported in accordance with 10 CFR 50.73(a)(2)(iv).

ATTACHMENT 1 TO 9005010072 PAGE 1 OF 1

Iowa Electric Light and Power Company

April 25, 1990
DAEC-90-0335

Mr. A. Bert Davis
Regional Administrator
Region III

U. S. Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, IL 60137

Subject: Duane Arnold Energy Center
Docket No: 50-331
Op. License DPR-49
Licensee Event Report #90-004

Gentlemen:

In accordance with 10 CFR 50.73 please find attached a copy of the
subject Licensee Event Report.

Very truly yours,

Rick L. Hannen
Plant Superintendent - Nuclear

RLH/HT/gt

cc: Director of Nuclear Reactor Regulation
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File A-118a

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